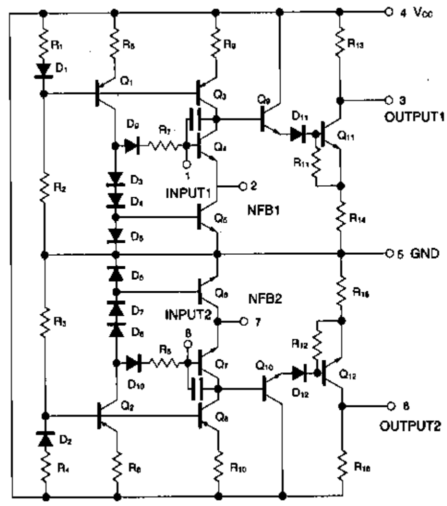
Dual preamplifier
BA328 / BA328F

The BA328 and BA328F are monolithic, dual-preamplifier ICs designed for car-audio systems.
They require few external components and allow compact set designs while reducing the number of assembly processes.

●Applications
Car and home stereos

●Features
1) Low noise.
2) Wide operating voltage range.
3) Built-in bias circuit minimizes the number of external components required.
4) High open-loop gain.
5) Good channel balance.

●Internal circuit diagram



●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limits	Unit
Supply voltage		V_{CC}	18	V
Power dissipation	BA328	Pd	900*1	mW
	BA328F		500*2	
Operating temperature		Topr	−25~75	℃
Storage temperature		Tstg	−55~125	℃

*1 Reduced by 9.0mW for each increase in Ta of 1°C over 25°C.

*2 Reduced by 5.0mW for each increase in Ta of 1°C over 25°C. (When mounted on a 50mm x 50mm x 1.6mm glass-epoxy PCB)

●Recommended operating voltage range (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	6	8	16	V

●Electrical characteristics (unless otherwise specified Ta = 25℃, Vcc = 8V, f= 1kHz, RL = 10kΩ and RE = 100Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Quiescent circuit current	I_Q	2	5	8	mA	V_{IN}=0V_{rms}	Fig.4
Open-circuit voltage gain	G_{VO}	65	80	−	dB	V_{OUT}=0.3V_{rms}, R_E=0Ω	Fig.4
Maximum output voltage	V_{OM}	1.0	1.5	−	V_{rms}	THD=1%	Fig.4
Input resistance	R_{IN}	50	−	−	kΩ	−	Fig.4
Total harmonic distortion	THD	−	0.1	0.3	%	V_{OUT}=0.3V_{rms}	Fig.4
Input conversion-noise voltage	V_{NIN}	−	1.2	2.0	μV_{rms}	R_g=2.2kΩ BPF (30Hz~20kHz)	Fig.4
Crosstalk level	CT	−	−65	−50	dB	Other channel V_{OUT}=0.3V_{rms}, R_g=2.2kΩ	Fig.4
Channel balance	CB	−	0	1.5	dB	V_{OUT}=0.3V_{rms}	Fig.4

●Electrical characteristics curves

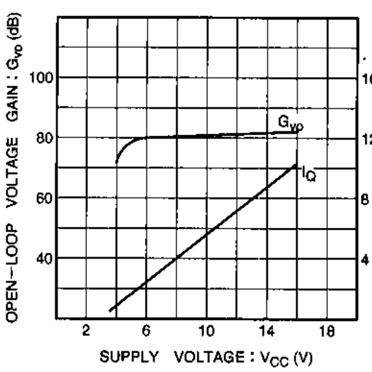


Fig. 1 Quiescent current and voltage gain vs. supply voltage

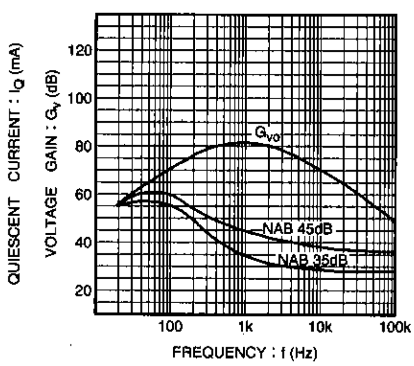


Fig. 2 Voltage gain vs. frequency

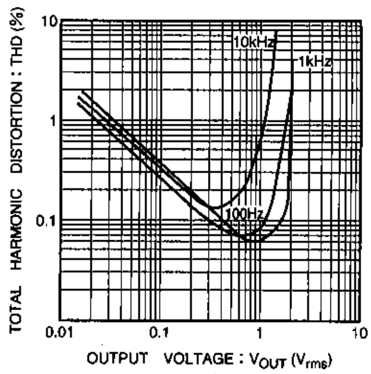


Fig. 3 Distortion vs. output voltage

●Measurement circuit

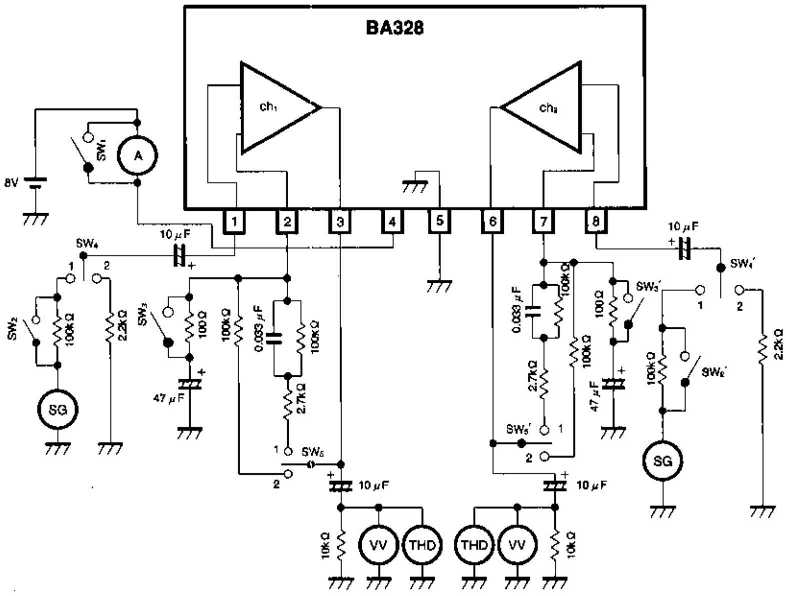


Fig. 4

●Description of external components

C_{IN} : input coupling capacitor

The recommended value is 10 μF. If the value of the capacitor is too small the characteristics at power on will deteriorate.

C_O : Output coupling capacitor

No particular requirements. A value of 4.7 to 22 μF is appropriate.

C_E : AC signal bypass capacitor

The recommended value is 47 μF. This capacitor sets the bass gain.

If a capacitor larger than the recommended value is used, the bass-region gain will increase, but the characteristics at power on will deteriorate. If the value of the capacitor is made smaller than the recommended value, the bass-region gain will be lower, but the power on characteristics will improve.

C_1 and R_1 Ripple filter components

The larger R_1 and C_1 are made, the better the ripple rejection ratio will be. However, if R_1 is made too large, the voltage drop that results will influence the maximum output.

Feedback pin : The closed-loop gain is roughly Z_{nf}/R_E.

Item	SW_1	SW_2 SW_2'	SW_3 SW_3'	SW_4 SW_4'	SW_5 SW_5'
I_Q	OFF	ON	OFF	2	1
G_{VO}	ON	ON	ON	1	2
V_{OM}	ON	ON	OFF	1	1
R_{IN}	ON	ON・OFF	OFF	1	1
THD	ON	ON	OFF	1	1
V_{NIN}	ON	ON	OFF	2	1
CT	ON	ON	OFF	2(1)	1
CB	ON	ON	OFF	1	1

Note: Bandpass filter used (30Hz to 20kHz).

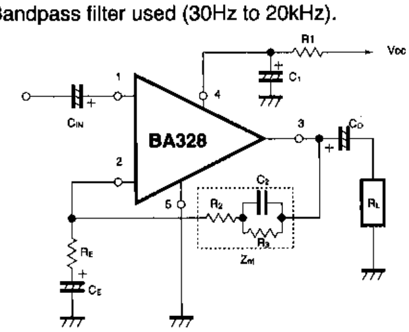


Fig. 5

● Application example

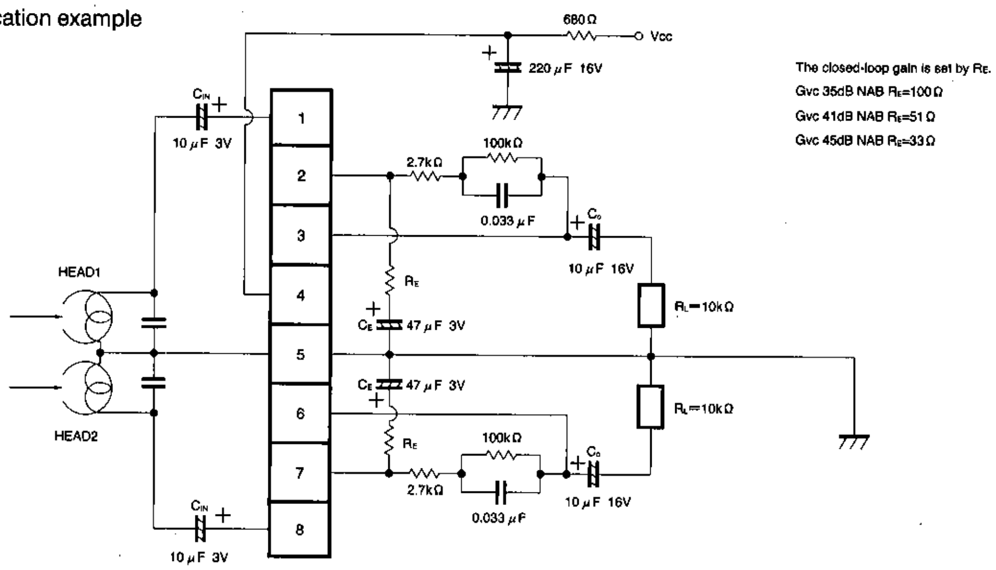


Fig. 6 Car stereo application

● Operation notes

Determining the DC output voltage (see Fig. 7)

The DC output voltage is determined as follows :

$V_{ODC} = (R_{nt} \times I_O) + V_{P2}$ (7)

VP2 (7) : DC voltage on pin 2 (7)

R_{nt} : DC feedback resistance

I_O is set internally.

In other words, pin 7 is a fixed current source, and when that current flows into the feedback pin, the voltage generated becomes the DC voltage. VP2 (7) is fixed at about 0.8V. When V_{ODC} is about 1 / 2 the supply voltage, V_{OM} is maximized.

I_O is fixed regardless of the supply voltage. Therefore, it is possible to set the DC feedback resistance after considering the required dynamic range and the minimum voltage applied to pin 4 (V_{CC}).

The recommended value is 100kΩ for a supply voltage of 6V to 16V.

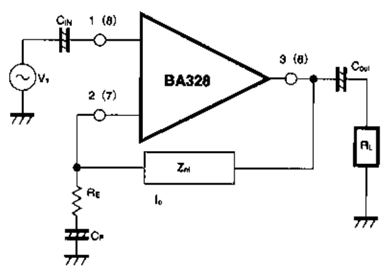
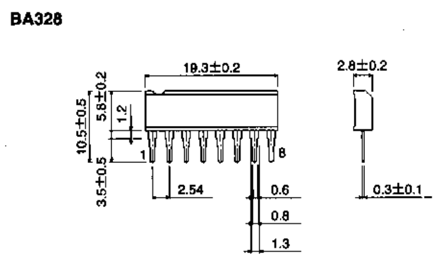
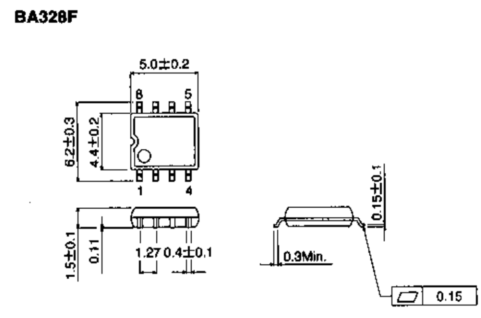


Fig. 7

●External dimensions (Unit: mm)



SIP8



SOP8